

What is security of supply in the open market and how to achieve it?

G. Granić *et al.*

PRELIMINARY COMMUNICATION

In the open market conditions the security of supply is limited. When a large number of players are introduced in to the system, each of them pursuing only partial and limited goals and tasks, the totality of care about security becomes vague. The analysis of the supply security in the responsibility chain, which is made of producers, transport or transmission operators, distributors, suppliers, regulators and buyers, shows that open market model carries inherent risks because final security instance is lacking. The proposal is to introduce the State as the final instance that should be responsible for security, clear defining of the responsibilities of all entities included in the responsibility chain, and for an efficient supervision over the obligations.

Key words: energy, open market, security of supply

1. Introduction

In its broadest sense, the security of supply can be defined as timely supply of energy in required quantities, quality and timelines at reasonable prices. This presumes that the technological, infrastructural, legislative and institutional assumptions are in place as to enable that contracted services/energy can be delivered to the consumers.

The essential determinates of the security of supply are the following:

- The scale of deficit of primary energy sources at a national territory,
- Energy supply from distant regions by means of transport, depending on energy product, as well as the risks of supply disruption or limited vulnerability,
- Degree of development of energy infrastructure at national level and degree of interconnections with neighboring countries,
- Renewable energy sources and the influence of volatility of resources, e.g. wind, solar energy, etc.,
- Legislation and institutional framework
- Energy prices.

The responsibility chain in security of supply encompasses: suppliers, distributors, transport or transmission system operators, producers, wholesalers, owners of primary energy sources, regulators, state and local administration, supranational associations, such as European Union and all of them has influence on security of supply. Sum of all business interest of the involved subjects has not necessarily to be equal to the interest of the state, neither in scope nor in dynamics. On Security of Supply have influences also subjects with different aims and interests, like land owners, local authorities, state administration, financial institution, etc. But for that situation should be an appropriate solution too. From the consumers' point of view, it is vital that conflicting interests or inadequacies of a part of the responsibility chain

can be compensated at other levels of the production-to-buyer energy flow.

2. Definition of the term of security of supply in the buyer-to-production chain and responsible entities

In each of the energy sub-systems (oil, gas, electricity, thermal energy, and renewables) the state of play is different, and such are the factors of influence. Each energy sub-system and energy market had its own development path and took its place in the energy mix of a specific country and in energy supply. Some sub-systems are influenced by global factors (oil, gas and coal), while in some regional (electricity) or local dimension prevails (heat energy and renewables). Common to all energy markets is the objective function: the production of electricity and thermal energy which mirrors all the changes occurring in the energy markets that make part of the chain.

Depending of a point of view, from buyers to producers of primary energy, the following definitions of the security of supply can be given:

- For buyers, security of supply is the supply of energy of contracted quality in a timeline that best suits the buyer's needs at reasonable price,
- For suppliers, security of supply is related to the quality of market, possibility of energy transport/transmission, and availability of spare capacities in case of incidents,
- For distributors, security of supply is related to availability of the distribution networks,
- For transport/ transmission system operator, security of supply is related to availability of the transmission and distribution networks, connections with neighboring countries, availability and serviceability of the neighboring networks, markets of balancing energy, ancillary services, share of renewable energy sources and possibility of balancing them, and the responsibility

ity of suppliers and their discipline in balancing the needs of their customers,

- For energy producers, security of supply is connected to reliability of the installations, reliability of primary energy product supply, reliability of energy transport/transmission, reliability of energy distribution, degree of market development and quality of suppliers,
- For wholesalers, security of supply depends on secure purchase, transport/ transmission and all other entities in the producer-to-buyer chain,
- For regulators, security of supply is well-functioning of all entities in fulfilment of their licence-based obligations,
- For states, security of supply is efficient energy supply to buyers and ability to deal with effects of incidents without affecting the supply to final customers. It is influenced by risks connected to energy imports in terms of quantities and purchase arrangements.

Through the whole responsibility chain, security of supply is influenced by:

- Technical/technological aspects related to operational reliability of the parts of energy infrastructure,
- Energy/economic/geopolitical aspects related to supranational transports from place of production to individual countries,
- Energy prices,
- Political relations and terrorism.

3. Analysis of the functioning of the security of supply system in its political (including all forms of threats), technology, market and economy related aspects

The concept of open market raises the question of the role of the state: where it should not be involved and where its presence is essential? Who is the final instance responsible for security of supply in one country? For the European Union important is the division of responsibility between the EU and the national states. In general, increasing degree of liberalization strengthens the security of supply simply due to the fact that with more participants in the market the flexibility of the energy system improves automatically. Liberalization, however, may bring new risks if the definition of the costs related to security of supply is left to the market. In this way, liberalization transfers the prime responsibility for security of supply from governments to market participants. But, is this the best model for reducing the risks when security of supply is concerned?

For energy buyers the final responsibility instance is the state, because it has legislative, political, and financial powers and, finally, because certain minimal quantities of energy are a civilization need which any democratic and socially responsible state must make available to its citizens. On the other side, buyers enter in legal (contractual) relation with suppliers, and thus responsibility lies with the energy companies.

The state can be considered responsible, or it must have a leverage to influence security in the following cases:

1. In the countries where the government administratively sets the cap on prices of electricity, and there is no market and the investments in the security of supply projects are reduced. The state administration, by distorting market mechanisms, directly influences the buyers' security of energy supply,
2. In situations where it is necessary to invest in energy infrastructure in order to develop a new market, to create new (unknown) customers or to increase energy consumption by existing customers. The most common situation threatening the security of supply is where the entire risk of investing in meeting the future energy demand is carried over on energy companies only. As a rule, energy companies can not meet unrealistic expectation of the state because they optimize the dynamics of the projects realization according to their own profit oriented interests. The experience shows that realization of such projects is sluggish and their dynamics is optimized in a way to alleviate the risks of the energy companies and not primarily to address the security concerns of the state,
3. In case of construction of energy infrastructure which should reduce all risks that may affect security, regardless of whether they come from politics, terrorism, natural disasters, or technical accidents. It is the responsibility of each state to assess the risks and the appropriate emergency provisions.

Regardless of how developed open energy markets are, security of supply in its large extent is the responsibility of the state. Those security issues that are in most part the state's responsibility can be divided in four groups:

1. inadequacy of transmission/transmission infrastructure needed for supplying energy to the territory of an individual state,
2. insufficient energy production in the territory of an individual state,
3. inadequate energy mix in final energy production,
4. inadequate infrastructure needed for energy storage in case of incidents regardless of their causes.

Given the fact that most of the (European) countries are energy importers, the fundamental issue of security of supply is not the system's self-sufficiency but the diminishing to the least possible measure of the risks related to import dependence. This presumes establishment of strong relations with the neighboring countries in one's environment and building supranational transport systems, for situations when energy can not be transported through national grids/networks. Also, the connecting of national systems and the construction of supranational transport systems are not possible without an active role of the state, through political arrangements, legislative and administrative procedures and financial support. It is vital to ensure the maximum utilization of the existing cross-border capacities (especially in interconnection power lines), and treat them in equal way as the internal transport/transmission networks. However, many steps in this regard may be opposed to the postulates of the open market, because, on one hand, market opening may enhance the security of supply, while on the other, it brings new threats for system sustainability, especially in

crisis situations. Financial intervention is needed for realization of the project in such timeframes that are optimal for security of supply and market development, and not in those suitable for energy companies only. This is a particularly sensitive issue in the natural gas sector.

The next issue refers to necessary production in a state's territory, and comes from the assessment whether cross-border trading can fully replace the production in a state's territory. This does not include long term agreements, no matter whether they come from the ownership or energy trading only. This issue mostly refers to electricity. Namely, abandoning long term agreements, in favor of market development, may lead to increasing risks and decreasing construction of new production capacities.

Given the technological characteristics of electricity, there is no such thing as absolute markets within the European Union, but only a series of regional markets. Regardless the operability degree of the transmission networks, due to the losses the exchange of electricity at large distances is not expected to make a significant part of the market. This imposes a possible requirement to set up an obligation for every country to cover a certain amount (e.g., 85%) of its demand with its own production and long term agreements, regardless of how the open market transactions were contracted. The role of the state is to create all necessary conditions to secure the needed production infrastructure in order to sustain the desired level of security.

Also, the security of supply can be weakened by an inadequate structure of primary energy mix in the power generation or insufficient number and capacities of gas supply routes. In gas industry it means that one depends on a single import supply route, and in power industry it means a too high dependence on one source only. Increasing the number of the supply routes or creating better infrastructure is the responsibility of the state, in cooperation, of course, with energy companies.

The incidents, ranging from political, terrorist or technological events to natural disasters, are reality to be reckoned with, and their impact on security of supply can be lowered only by building strategic storage capacities for gas and oil products.

4. Distribution of responsibility (EU) - state-producer - operator-regulator - supplier- customer

The concept of open market and institutional capacity building are designed for well functioning markets. Removing political power from the process of price setting and creating economic conditions is a prerequisite for the sector's normal functioning and development and maintaining supply security. However, the position and the actions of the government are necessary in the area of security of supply, besides the responsibilities of other energy market participants. Thus, the responsibility is distributed as follows:

1. National states and the EU are primarily responsible for security of supply in terms of legislation, procedures and actions in situations where market mechanisms do not provide necessary dynamics in energy

infrastructure development. It is the state that oversees the security and takes appropriate measures,

2. Setting up tariffs is the responsibility of regulators, and there should not be political interferences. Regulators themselves assess security of supply, acting as a control mechanism capable of recognizing problems and taking appropriate measures,
3. Producers are oriented towards their own economic interest. They can be imposed, under non-discriminatory terms, the obligation to implement security of supply provisions within their business activities,
4. Suppliers are responsible for security in relation to business risks they infer to customers or to the system as a whole,
5. Energy buyers must know themselves, their technological processes and be responsible for security of supply when contracting purchase of energy.

5. Analysis of critical elements of security of supply in open market

Apart from technological incidents, which affect security and which are responsibility of the part of the energy system where they occur so it must deal with the security problems, critical elements which induce insecurity in to energy systems usually come from situations which can not be solved by a single energy entity. Most often such problems come from political sphere, including international conflicts, terrorism, political conflicts, and neighbors' disputes which all may include multiple countries.

Energy prices may be a critical element, in the countries where the government exercises influence on price setting mechanism. The energy companies' financial inability to realize the projects significant for security leads to limited security.

Each country must permanently make long term security assessments and have possibility to intervene at the market, where market mechanism themselves are not able to deliver the projects necessary for security of supply.

The assessment of security of energy supply to final customers at the national level must be based on relevant indicators reflecting three interconnected and characteristic areas: technical, economic and societal. Today, there is no single methodology that would measure the security of a national energy system or of an energy sector. In the literature published so far proposed are many indicators in order to get as good as possible insight in the energy system of a particular state, energy sector or a company, from energy, economic and environmental points of view. Such indicators should facilitate a better implementation of the energy and economic policies taking into account many risks which may be: physical (energy forms), economic, societal, and environmental. In essence, they all present the picture of one segment of a complex system and are mainly based on deterministic approach. However, the reality is much more intricate and it will be necessary to put additional efforts in developing and proposing the methodology which would allow to assess the security of energy supply at the national level, and would include all relevant factors with their uncertainties

that come from economic, societal and technical nature of energy from its source all way to the consumption level.

6. Economic consequences of security of supply

Security of supply is a real category with its costs, i.e., it comes with a price. The security of supply costs must be recognized in the price of services delivered. All researches show that the price of non delivered energy, including direct and indirect costs, is much higher than the energy price itself and investments in security.

Each entity in the responsibility chain, from state to buyer, can assess its own security of supply and potential threats. It is the obligation of each energy entity. Their assessments should include all the risks they can influence and eliminate or reduce to a minimum.

For security as a whole, important is the security assessment made at the top level of the responsibility pyramid, i.e., government or ministries responsible for the energy sector. Given the fact that only governments have influence on non-energy factors, their measures may work both ways: in favor of and contrary to security of supply.

For the state, economic consequences of inadequate security may be either to invest in enhancing security of supply or to suffer potential damage in form of decreasing GDP or GNP.

The gas crisis in January 2009 clearly demonstrated how necessary it had been to invest in additional infrastructure in order to reduce the risks of supply disruptions. Namely, the additional investments (e.g., investments in reverse flows) would have been many times lower than the additional damage occurred due to lack of such investments.

7. Possibilities of improving security of supply system

Security of supply overcomes the capacities of each individual country, except for a part of a group of large countries which may (eventually) achieve this security on their own. In the European Union, not even the largest countries can achieve security of supply in full. Therefore, there is a need to clearly identify the obligations at the EU level and at the level of individual countries. This includes:

- Uniform methodologies, criteria and indicators for assessing security of each member state and the EU as a whole,
- Obligation to produce annual reports on long term (10 years) security of supply for each member state and the EU as a whole,
- Defining provisions and creating appropriate assumptions for the interventions by the EU and member states when the assumptions for security of supply are not in place. This refers to legislative administrative, financial and in particular implementing scenarios designed for fighting all kinds of obstructions of supply (in January 2009 it took as long as ten days for Europe to re-establish the gas flows from other directions),

- Unilateral planning and measures for maintaining security may be detrimental for other state (which was demonstrated in the 2009 gas crisis). Thus, it is necessary to enhance multilateral planning and coordination (solidarity) in crisis situations,
- Establishing supranational supervision over all security parameters in order to be able to timely identify the supply security problems and set off coordinated measures at all three stages of crisis management (warning, preparedness, emergency),
- Each country should have institutional solutions when it comes to addressing the security issues, if market mechanisms are not adequate to respond to security threats,
- In all countries it is necessary to ensure real prices for energy, so that the prices would not be an obstacle and reason for reducing necessary investments and thus undermining security of supply. The measures for protecting socially vulnerable consumers should be obligatory,
- Improving the transport/transmission capacity allocation and congestion management system,
- Preparing supranational (regional, all-European) investment plan with a clear priority projects list with a view to maintain security of supply.

8. Recommendations

1. The open energy market concept should be accompanied with clearer and specific security responsibilities of all entities participating in the market, including the state,
2. In the energy tariffs security of supply must be recognized as a part of the service that customers pay for,
3. In addition to technical and technological issues, the security standards should also include the degree of interconnections with neighbors, infrastructure development in each country's territory, and responsibility towards multinational projects even if they do not generate immediate benefits,
4. Due to crucial importance of the secure energy supply for the economy it is necessary to permanently implement appropriate supervising measures at all levels (state, regulators, operators) and monitor the most influential elements of security, and publish reports, recommendations and provisions aimed at improving security of supply both at national levels and at a coordinated supranational level.



Author:

Goran Granić, Energy Institute Hrvoje Požar, Zagreb, Croatia, ggranic@eihp.hr

Contributors:

Branka Jelavić, PhD, EIHP, Croatia, bjelavic@eihp.hr

Mislav Majstrović, Ph.D. Prof., EIHP, Croatia, mmajstro@eihp.hr

Goran Majstrović, Ph.D, EIHP, Croatia, gmajstro@eihp.hr

Mladen Zeljko, Ph.D, EIHP, Croatia, mzeljko@eihp.hr

Damir Pešut, M Sc., EIHP, Croatia, dpesut@eihp.hr

Robert Bošnjak, B Sc, EIHP, Croatia, rbošnjak@eihp.hr

Marko Karan, B Sc, EIHP, Croatia, mkaran@eihp.hr